dren with CD4 counts of less than 0.5 × 10^9 per liter (500 cells per μl) or any child with CDC-defined AIDS. The usual initial dose is 180 mg per m^2 per dose every six hours, with dose reductions as needed because of hematologic or hepatic toxicities. Zidovudine is particularly valuable in reversing HIV encephalopathy. Side effects include neutropenia, anemia, and hepatic derangement.

The intravenous administration of immune globulin, 400 mg per kg every three to four weeks, is recommended if there is evidence of poor antibody function. All routine childhood immunizations should be given except that inactivated polio vaccine is given rather than oral polio vaccine. Despite these immunizations, immunity is not assured owing to deficient antibody responses. Appropriate antibiotics and antivirals are used promptly with each significant infection. Varicella-zoster immune globulin is used following varicella exposure. Other drugs such as dideoxyinosine (DDI), soluble CD4, and hyperimmune intravenous immune globulin are under investigation. The use of these therapies should improve survival, which is now about 38 months from time of diagnosis.

California has three centers for the treatment of pediatric AIDS: the San Francisco Bay Area (D. Wara, MD [415] 476-1736), the Los Angeles area (Y. Bryson, MD [213] 206-6369), and the San Diego area (S. Spector, MD [619] 543-6447). All are part of a national network of pediatric AIDS centers supported by the National Institutes of Health. Further information and referrals are available at these centers.

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REFERENCES

Falloon J, Eddy J, Wiener L, Pizzo P: Human immunodeficiency virus infection in children. J Pediatr 1989; 114:1-30

Johnson JP, Nair P, Hines SE, et al: Natural history and serologic diagnosis of infants born to human immunodeficiency virus-infected women. Am J Dis Child 1989; 143:1147-1153

McKinney RE, Pizzo PA, Scott GB, et al: Safety and tolerance of intermittent intravenous and oral zidovudine therapy in human immunodeficiency virus-infected pediatric patients. J Pediatr 1990; 116:640-647

Scott GB, Hutto C, Makuch RW, et al: Survival in children with perinatally acquired human immunodeficiency virus type 1 infection. N Engl J Med 1989; 321:1791-1796

Newborn Hemoglobinopathy Screening

IN FEBRUARY OF 1990, California implemented hemoglobinopathy screening as part of the routine neonatal screening program. The hemoglobinopathy screening is done on all newborns regardless of race, creed, color, or ethnicity. The purpose of the screening is to identify infants with a clinically significant hemoglobinopathy and refer them to comprehensive-care sickle cell centers for follow-up support services. The Cooperative Study of Sickle Cell Disease, conducted by the Sickle Cell Branch of the National Institutes of Health, showed the effectiveness of parental education for the pediatric patients. Most deaths of children with sickle cell disease occurred between the ages of 1 and 3 years from serious infections. It has been reported that educating parents to take a temperature and identify a fever has decreased the mortality rate of young children with sickle cell anemia. Furthermore, the education of and counseling to parents on the importance of prophylactic penicillin have been demonstrated in national studies to decrease significantly the morbidity and mortality due to overwhelming infection or sepsis in infants with hemoglobin SS disease. Because sickle cell anemia occurs in 1 in 500 live births in the African-American population, primary care providers must be aware of the newborn screening process and participate actively in the referral and follow-up of these patients.

Primary physicians are notified by letter or a telephone call from the newborn screening nurse coordinator in the area. The patient's name, date of birth, mother's name and address, and preliminary diagnosis are provided. When a patient is seen for the initial visit, it is strongly recommended that the primary physician begin prophylactic penicillin therapy, inform the family of the comprehensive care sickle cell center in the area and encourage them to call for an appointment, and call the sickle cell center and make a referral.

The role of comprehensive-care sickle cell centers in the management of clinically significant hemoglobinopathies in newborns includes medical intervention and consultation by a pediatric hematologist with specific training in hemoglobinopathies; a nurse specialist to provide clinical assessment and parental education; a master's level social worker or equivalent family therapist to discuss psychosocial issues or needs that may affect the child or family; and within the comprehensive care setting, other health professionals who are available for consultation from various specialty areas to meet patients' needs.

In addition to identifying sickle cell disease, the newborn screening program will detect variant forms of other significant hemoglobinopathies as well as heterozygote hemoglobin disorders such as AS, AC, and AD. These traits appear to be harmless and do not cause serious health problems. Combination hemoglobinopathy-thalassemia syndromes will also be detected by the newborn screening program. In California, all infants having these traits are referred to primary care physicians by a letter from the Department of Health Services, Newborn Screening Section. This letter also lists the names of sickle cell counseling centers in the family's area that can provide information on the hemoglobin trait the child has by the authorization code assigned by the Newborn Screening Section. The physicians again play an important role in providing initial information and counseling and by referring such families to comprehensive-care sickle cell centers for more in-depth education and counseling.

Full participation by primary care providers in this program is essential for its success and should result in optimal care for children with substantial hemoglobinopathies.

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REFERENCES

Charache S, Lubin B, Reid C (Eds): Management and Therapy of Sickle Cell Disease. Washington, DC, National Institutes of Health Publication 89-2117, September 1989, pp 11-14

State of California, SB-480 (Hemoglobin Screening), February 1990

Vichinsky E, Hurst D, Earles A, Kleman K, Lubin B: Newborn screening for sickle cell disease: Effect on mortality. Pediatrics 1988; 81:749-755

Steroid Therapy for Bacterial Meningitis

THE IDEA THAT glucocorticoids might prove to be a useful adjunctive therapy for meningitis has been in the literature for more than 30 years. The choices of experimental design, the choice of steroids administered, the choice of dose, and the lack of clarity about which outcomes to measure all stood in the way of demonstrating a beneficial effect. During the past five years two separate lines of investigation have provided much new information in this area.

The development of an excellent rabbit model for purulent meningitis allowed several groups of investigators to work out the pathophysiologic events in bacterial meningitis. Bacteria enter the central nervous system, multiply rapidly, and liberate cell wall products (endotoxin,

teichoic acid). These inflammatory agents in turn stimulate host cells to produce various potent cytokines (tumor necrosis factor, interleukin, and others). The inflammatory cascade results in a serious pathologic disorder including brain edema, increased intracranial pressure, decreased cerebral perfusion, a loss of autoregulation, and, ultimately, permanent brain damage. Rabbits are well suited to the study of various forms of therapy, including the use of anti-inflammatory drugs. It has been clearly shown that in rabbits the use of dexamethasone given simultaneously or before antimicrobials in cases of *Hemophilus influenzae* meningitis abolishes or greatly ameliorates the profound inflammatory response and other untoward consequences of infection that cause most of the residual damage. Not all steroids have similar anti-inflammatory action. Methylprednisolone, for example, fails in several important respects.

At the same time, the use of dexamethasone has been evaluated in human studies, mostly in children with *H influenzae* meningitis. The pathophysiologic studies had results similar to those found in rabbits. Children given dexamethasone had fewer signs of inflammation. Adverse effects of dexamethasone use appear to be limited to a small incidence (1.5%) of gastrointestinal bleeding. Well-controlled outcome studies in several hundred patients failed to show the effects of dexamethasone therapy on mortality, which was low in this series. The early use of the drug, however, along with antimicrobial therapy was associated with a distinctly lower incidence of bilateral moderate or greater hearing loss compared with results in patients treated with antimicrobials or a placebo. Confounding the results was the use of cefuroxime as the antibiotic in portions of the study. This agent is no longer recommended for the treatment of bacterial meningitis due to its delay in sterilizing the cerebrospinal fluid of patients.

The immediate application of the new knowledge to clinical practice is still somewhat controversial. Multicenter studies including larger numbers of children in the United States and abroad are in progress. Larger numbers will be of great value in further evaluating both the beneficial effects of adding steroids to the treatment regimen and further exploring any adverse effects.

As we await the outcome of these expanded trials, the American Academy of Pediatrics has recommended "individual consideration of dexamethasone for bacterial meningitis in infants and children 2 months of age and older after the physician has weighed benefits and possible risks." The only published regimen for dexamethasone is 0.6 mg per kg of body weight per day in four divided doses given intravenously for four days beginning with or just before the first dose of antibiotic therapy. The use of dexamethasone in bacterial meningitis due to organisms other than *H influenzae* is not established, but it may be reasonable to use the drug in a child with purulent meningitis in whom the bacterial cause is not yet confirmed. There is no reason to use dexamethasone in patients with aseptic meningitis. The use of steroids in adult patients should await the outcome of further clinical trials. Another important area awaiting clinical trials is the use of steroids in neonatal meningitis.

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REFERENCES

Committee on Infectious Diseases, American Academy of Pediatrics: Dexamethasone therapy for bacterial meningitis in infants and children. Pediatrics 1990; 86:130-133

Girgis NI, Farid Z, Mikhail IA, Farrag I, Sultan Y, Kilpatrick ME: Dexamethasone treatment for bacterial meningitis in children and adults. Pediatr Infect Dis 1989; 8:848-851

Havens PL, Wendelberger KJ, Hoffman GM, Lee MB, Chusid MJ: Corticosteroids as adjunctive therapy in bacterial meningitis—A meta-analysis of clinical trials. Am J Dis Child 1989; 143:1051-1055

Lebel MH, Friej BJ, Syrogiannopoulos GA, et al: Dexamethasone therapy for bacterial meningitis: Results of two double-blind, placebo-controlled trials. N Engl J Med 1988; 319:964-971

Saez-Llorens X, Ramilo O, Mustafa MM, Mertsola J, McCracken GH Jr: Molecular pathophysiology of bacterial meningitis: Current concepts and therapeutic implications. J Pediatr 1990; 116:671-684

Tauber MG, Sande MA: Dexamethasone in bacterial meningitis: Increasing evidence for a beneficial effect. Pediatr Infect Dis 1989; 8:842-844